ALASKA
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPAR DIVISION REPORT

An Assessment of the Occurrence and Distribution of MTBE in Alaska Groundwater

Alaska Department of Environmental Conservation
Spill Prevention and Response
Storage Tank/Contaminated Sites Remediation Program
April 2001

Introduction

Methyl tertiary butyl ether (MTBE) is a volatile oxygen-containing organic compound made from methanol and isobutylene. MTBE has been used as an octane enhancer since 1979 and was originally used to replace leaded gasoline. Regular unleaded gasoline may contain 0.2 percent MTBE by volume and octane enhanced gasoline, such as premium, may have 2 percent to 9 percent MTBE by volume. Oxygenated fuel used to comply with Control Area requirements under the Clean Air Act may have MTBE added to 11 percent to 15 percent of volume. Alaska used 15 percent blend. Large-scale use of MTBE nationally began in 1995 with the introduction of reformulated gasoline that contained 11 percent MTBE by volume. A number of states are detecting MTBE in groundwater, including drinking water supplies. This includes states that have no evidence of use of MTBE as an oxygenate in their state.

Recorded use of MTBE oxygenated fuels in Alaska are limited to the Anchorage and Fairbanks Control Areas from November 1992 through December 15, 1992. MTBE was used with a 15 percent blend. On December 15, 1992, Governor Hickel issued a moratorium on the use of MTBE as an oxygenate for compliance with the Clean Air Act due to health concerns. The 1993 EPA Health Assessment Report recorded MTBE use in Fairbanks for regular gas at 0.2 percent, premium at 2-9 percent, and in reformulated gas at 15 percent. The Alaskan petroleum refineries phased out the use of MTBE as an oxygenate and switched to ethanol as an oxygenate in 1993.

In 1999 several contaminated underground storage tank sites were sampled for a suite of oxygenates including MTBE. Out of 15 sites, 4 had confirmed MTBE contamination. The owner of the sites stated that fuels were purchased from the Tesoro and William's refineries. It is thought that most MTBE occurred from historical leaking undergound storage tank systems or spills. It is also unclear that the MTBE is from a past or recent release. No underground storage tanks in other areas of the state have been systematically monitored for MTBE.

Sampling since fall 1995 by the ADEC Air Program of tanks in the Fairbanks and Anchorage areas for compliance with Control Area requirements has never detected MTBE. Control Area sampling is to test oxygenated fuels and is only done during November through March 1. The state Chemistry Lab in Juneau uses octane gasoline from gas stations in Juneau as the laboratory blank for fuel analysis for the Clean Air Program. Oxygenates are not used in southeast gasoline to boost octane (personal communications- Sara Rarick).

ADEC requested data from the EPA Fuel and Fuel Additives Program for the two refineries in the state during the year 2000. The request was denied due to confidentiality requirements.

MTBE and the Environment

MTBE characteristics in the environment are different from those of gasoline constituents and solvents. MTBE is highly water-soluble and moves through soil rapidly in groundwater. It is less likely to adhere to organic soil particles and is less likely to undergo biodegradation. Because of its rapid movement and resistance to natural attenuation and treatment, MTBE can be a difficult contaminant to deal with during site remediation.

MTBE is typically released to the environment through point source releases such as leaking underground storage tank facilities or spills during gasoline refining, distribution, use and storage. Non-point sources of contamination such as automobile emissions and evaporative losses may also contribute to MTBE in the environment.

Health Effects

At this time there is not enough evidence for EPA to classify MTBE as a known or probable human carcinogen. Limited laboratory studies have shown it to be a carcinogen for rodents. Since there is currently no human or animal studies on the health effects of MTBE in drinking water, it will be approximately 10 years before a drinking water maximum contaminant level is set. Public drinking water systems over 10,000 will be required to monitor for MTBE starting January 2001. In 1997, the EPA Drinking Water Health Advisory for MTBE has set a range for MTBE at 20-40µg/L for drinking water based upon taste and odor concerns. Nationally, MTBE contamination of water supplies as low at 15 µg/L has forced some public water systems to seek alternative water because of taste and odor complaints. On March 3, 2000, EPA announced the signification reduction or ban of MTBE as a fuel additive because it poses an "unreasonable risk to the public or the environment."

Acute toxicity of MTBE in animals includes mild skin and eye irritation. Chronic exposure can effect rodent kidney and liver at high levels of ingestion and inhalation. Anecdotal information from human exposure during the introduction of MTBE in Fairbanks and Anchorage in winter of 1992 included headaches, rashes, nausea, and eye irritation.

Other state clean up standards range from 13.5 to 50,000 µg/L depending upon the groundwater use and the method that each state uses to set clean up standards. Many states are setting a clean up standard based upon site specific risk assessment. Alaska is in the process of reviewing MTBE toxicological data and other information to use in setting clean up standards and MTBE site remediation. Alaska Department of Environmental Conservation conducted a study to sample for MTBE to find out the magnitude of the problem in Alaska for leaking underground storage tank sites.

Main Objective

The main objective of the MTBE study in Alaska was to determine the occurrence of MTBE in groundwater at selected leaking underground storage tank (LUST) sites. The results of the study were used to determine if the occurrence or concentrations are significant enough to require sampling for MTBE for all LUST sites and to establish an MTBE cleanup standard to protect public health or safety, or the environment.

METHODS

Sampling

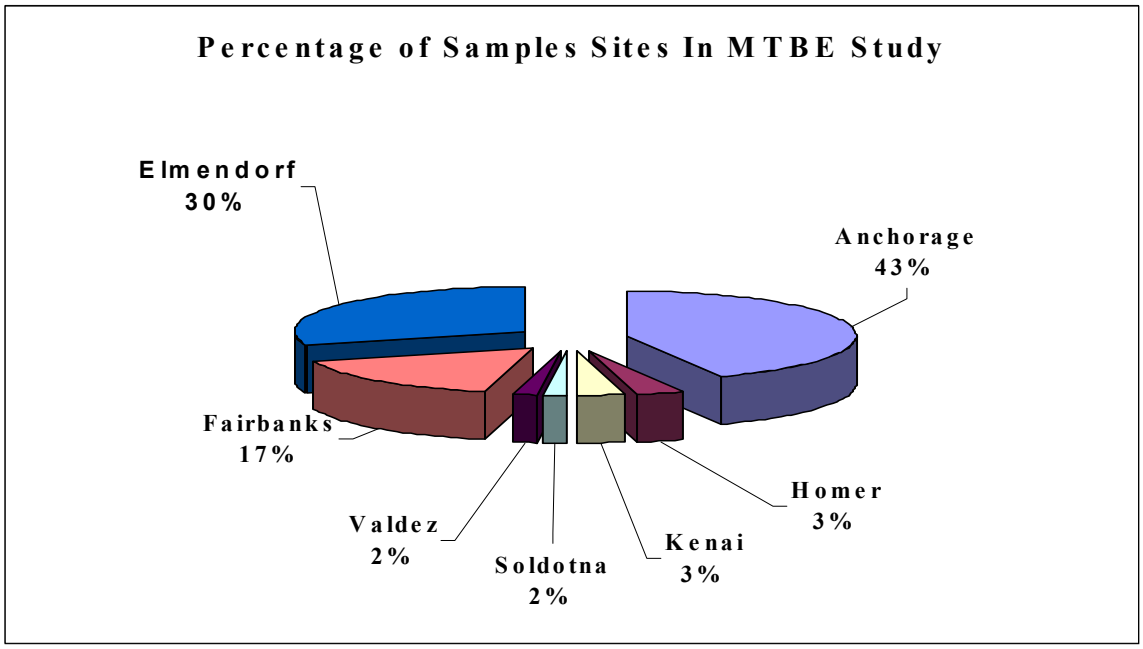
LUST sites considered for sampling had a history of gasoline storage and contamination and where groundwater monitoring was in place or where wells were to be installed during the study. LUST sites sampled included grant recipient sites on the FY 2000 Financial Assistance Program (FAP) cleanup list, sites owned or operated by Tesoro or Chevron, one military base, and some private LUST sites identified by ADEC project managers. Except for FAP sites, the responsible party paid for the laboratory analyses cost.

Density of samples and sites per location are shown in Table 1 and Figure 1. The study sites were located mostly in Anchorage and Fairbanks, the two largest urban areas in Alaska having the largest density of LUST sites. Sampling also was done on the Elmendorf Air Force Base as part of a groundwater study being done base-wide. Several sites in Juneau, Ketchikan and Nikiski were also selected for sampling, but were not included in this study report as samples had not yet been collected.

Table 1: Sample Sites and Number of Samples Per Area

Location	Sites/Area	% Total Sites	Samples/Area	% Total Samples
Anchorage	**26**	**43.3%**	**90**	**45.0%**
Elmendorf	**18**	**30.0%**	**93**	**46.5%**
Fairbanks	**10**	**16.7%**	**11**	**5.5%**
Homer	**2**	**3.3%**	**2**	**1.0%**
Kenai	**2**	**3.3%**	**2**	**1.0%**
Soldotna	**1**	**1.7%**	**1**	**0.5%**
Valdez	**1**	**1.7%**	**1**	**0.5%**
TOTALS	**60**	**100%**	**200**	**100%**

Figure 1: Percentage of Sample Sites in MTBE Study



There are approximately 524 sites with known groundwater impacts from petroleum. A regional breakdown by location for these sites shows that 72 percent of the sites are in Southcentral region, 24 percent in the Northern region and 4 percent in the Southeast Region (Figure 2). The sample site population represents 15 percent of the total known LUST sites with groundwater impacts. A map of the regions and what sample sites they cover is shown in Figure 3.

Figure 2: Percentage of Sites with Groundwater Contamination by Region

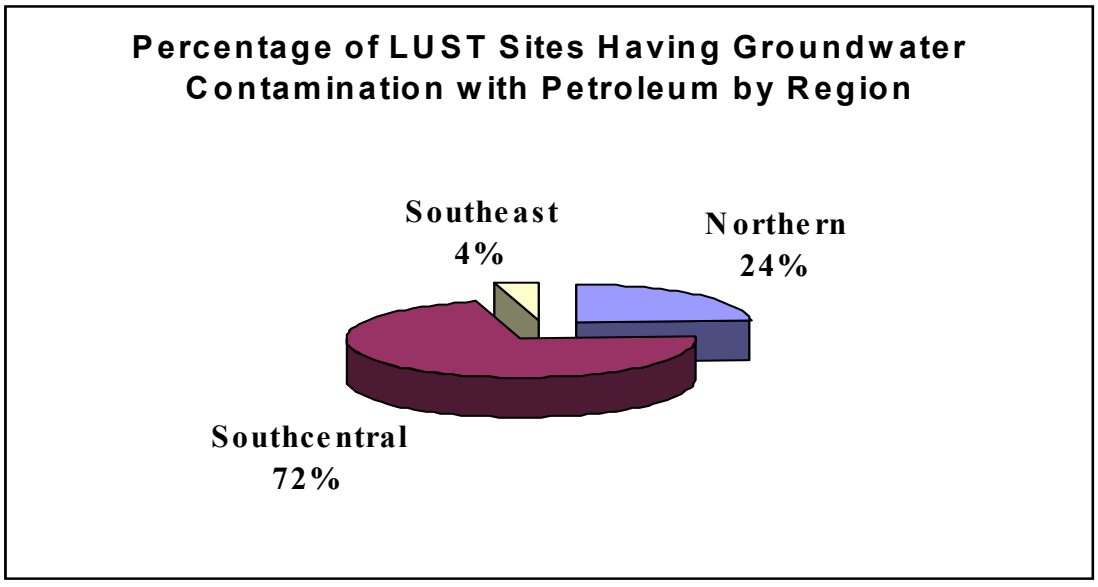
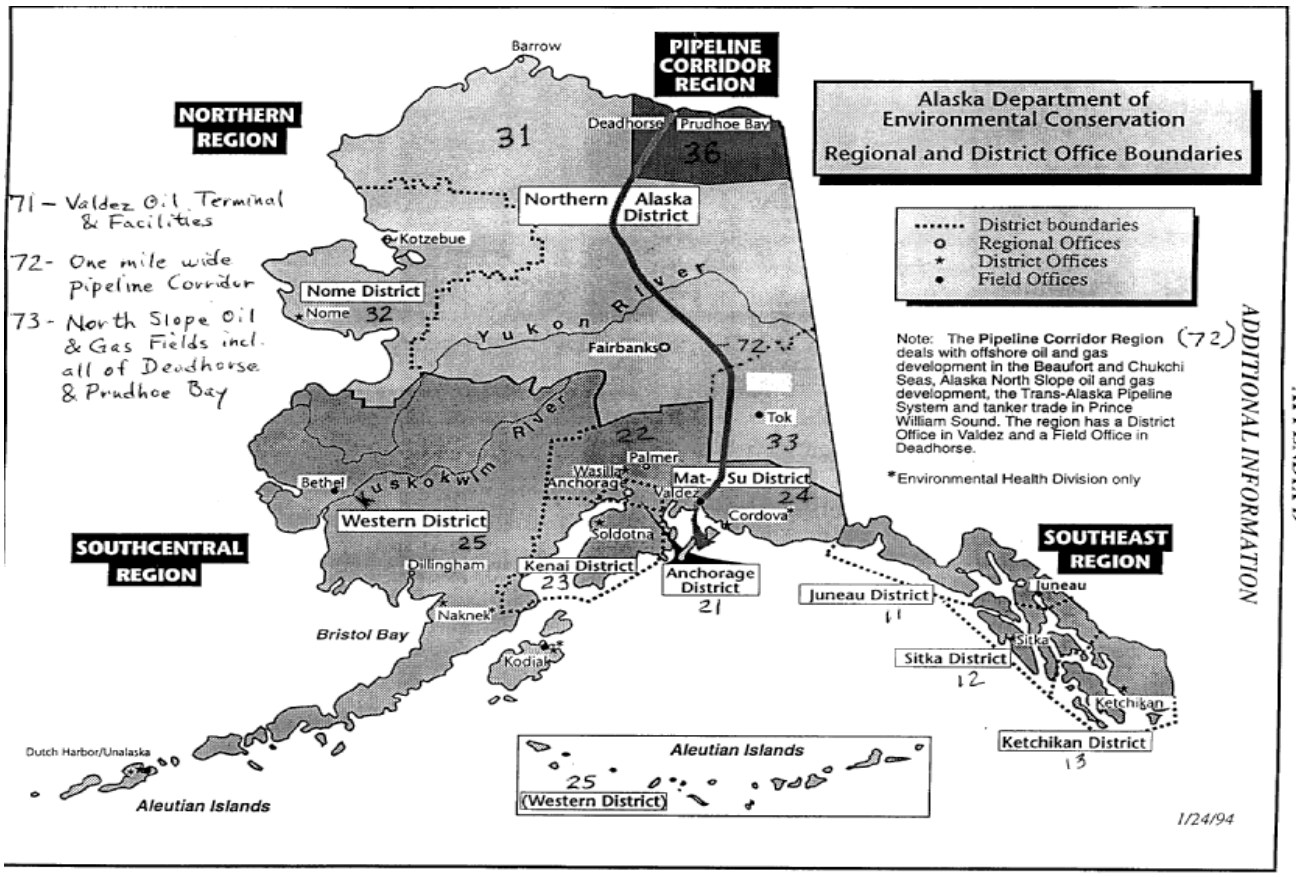


Figure 3: Map of Regions Sampled



Contractors conducting groundwater monitoring at the selected sites were used to take samples. Contractors working at FAP sites took the samples and used one of the three laboratories in the state approved to do EPA Method 8260B. The DEC site project manager determined the extent and method of sampling for their sites. Groundwater monitoring wells were sampled according to procedures referred in the ADEC Underground Storage Tanks Procedures Manual, March 1, 1999, Section 4.7 for sampling methods. The sampling events happened during the spring and summer of 2000.

Analytical Procedure

EPA Method 8260B a purge and trap, capillary column gas chromatography/mass spectrometry (GC/MS) method was used in this study. The method yields reliable results, no false positive identification and is unaffected by high gasoline interference. Duplicate 40 mL vials with teflon lined septa will be used per sample. Samples will be preserved by adjusting to pH $\leq$ 2 with 1:1 HCl and stored between 2 to 4 degrees centigrade. Maximum holding time is 14 days. Method detection limit (MDL) is 0.8 ppb. The laboratories analyzed for and reported all contaminants that may be detected by this method. Results for all analytes listed for Method 8260B were reported. EPA Method 8021 was used at some sites for initial screening.

Results

By Location

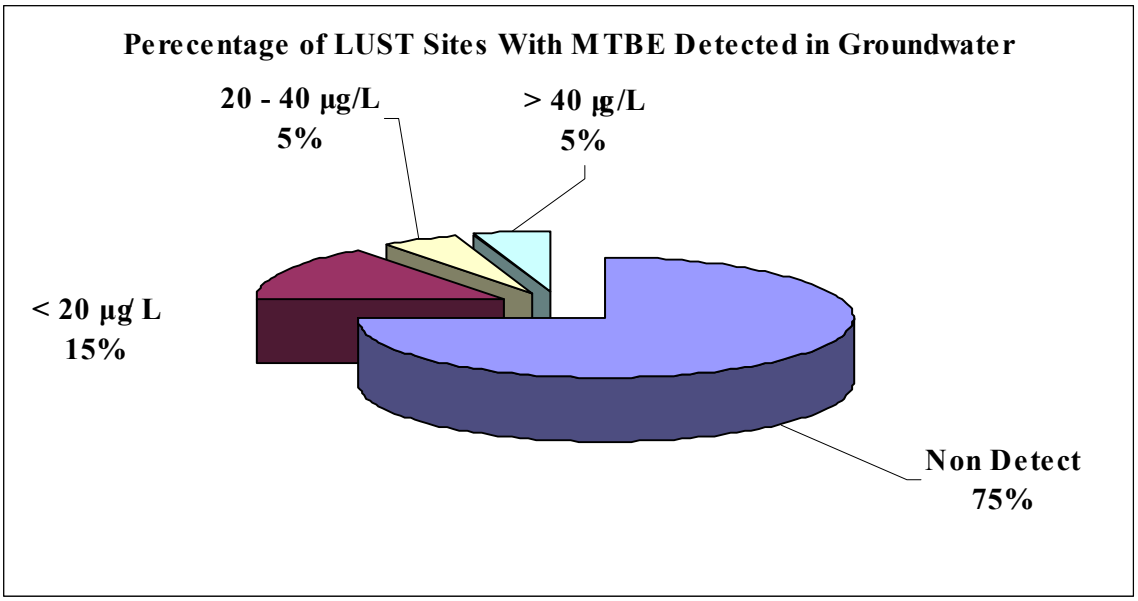
MTBE in groundwater was detected at 9 out of the 60 sites sampled or 15 percent of sites sampled (Table 2 and Figure 4). Five sites had concentration limits less than the method detection limit of 5 ug/L. Only 3 sites out of the 9 were found to have MTBE or 5 percent of total site sampled were greater than 20 ug/L, the lower value of the EPA drinking water advisory (Table 2 and Figure 4). The majority of the sites contaminated with MTBE are in Anchorage and Fairbanks areas where the population density is over 100,000. One site at Elmendorf Air Force Base was also detected. Of the 60 sites, 41 sites or 68 percent had release report dates before 1996. The remaining sites were discovered when tanks were upgraded and the contamination from spills and/or releases are believed to have occurred before 1996. All the analytical results from the study and confirmed release dates for each site are shown in Appendix Table A.

Table 2: No. of Sites and Percent Totals with Detectable MTBE Concentrations

Location	No. of Sites	No. of Sites Impacted	% Total Sites Impacted	No. of Sites < 20 ug/L MTBE	% Total Sites < 20 ug/L MTBE	No. of Sites > 20 ug/L MTBE	% Total Sites > 20 ug/L MTBE
Anchorage	26	7	12%	4 *	7%	3	5%
Elmendorf	18	1	1.5%	1	1.5%	0	-
Fairbanks	10	1	1.5%	1*	1.5%	0	-
Homer	2	0	-	0	-	0	-
Kenai	2	0	-	0	-	0	-
Soldotna	1	0	-	0	-	0	-
Valdez	1	0	-	0	-	0	-
TOTALS	60	9	15%	6	10%	3	5%

*** All sites had concentrations < 5 ug/L - the method detection limit for Method 8260B.**

Figure 4: Percentage of LUST Sites with MTBE Detected



By Sample

Of the 200 samples taken during the study period, 17 samples or 8 percent of all samples taken were greater than 20 ug/L (Table 3 and Figure 5). Only 7 samples or 3 percent of the total samples taken were above the EPA Advisory Drinking Water Lower Level of 20 ug/L (Table 4). All sites above 20 ug/L were in the Anchorage vicinity. Two of the samples had the highest concentrations found of 10,300 and 5,990 µg/L were located at the same site in Anchorage. The site had a release date recorded as 1992 when MTBE was reported to have been in the state.

Table 3: Occurrence of MTBE Contamination by Concentration Grouping

Concentration (ug/L)	No. of Samples	% Samples
Non Detect	183	91%
< 5 ug/L	6	3%
> 5 ug/L and < 20 µg/L	4	2%
20 - 40 µg/L	3	2%
> 40 µg/L	4	2%
Total	200	100%

Figure 5: Percentage of Groundwater Samples with MTBE Detected

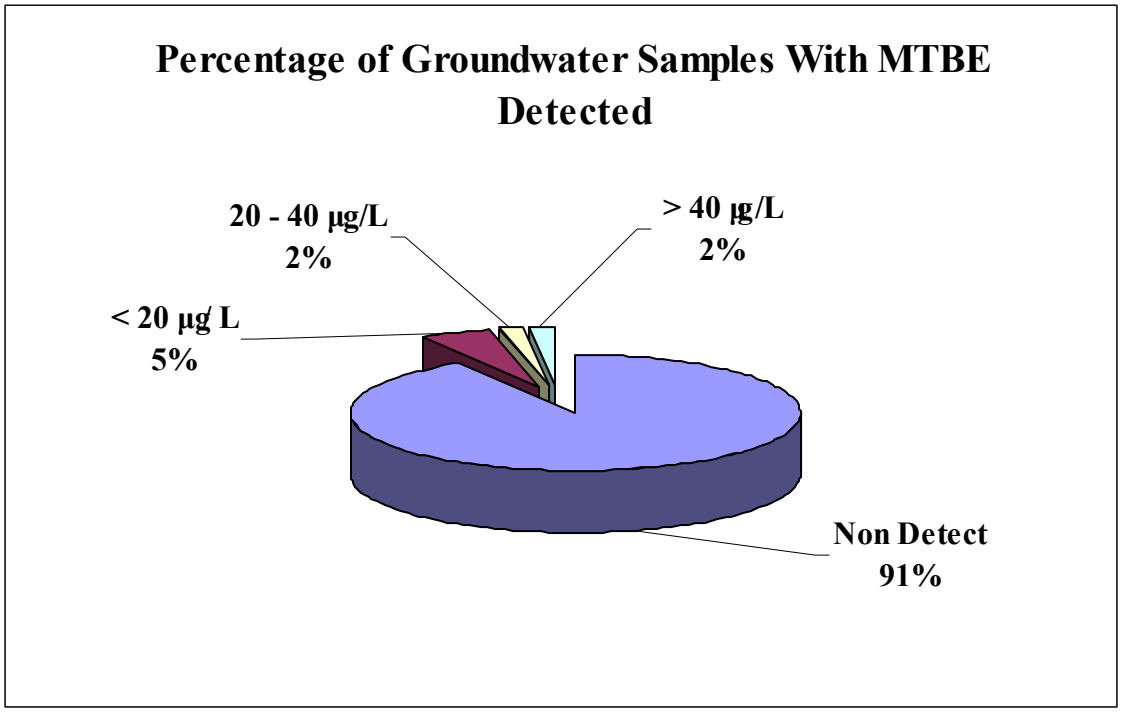


Table 4: No. of Samples (Percent Totals of All Samples) with Detectable MTBE Concentrations

Location	No. of Samples Taken	No. of Samples Non Detect	No. of Samples Above Non Detect	No. of Samples < 5 ug/L Method Threshold Limit	No. of Samples >5 ug/L and <20 ug/L MTBE	No. of Samples 20 - 40 ug/L	No. of Samples >40 ug/L MTBE	No. of Samples =or> 20 ug/L EPADrinking Water Advisory Level
Anchorage	90	77 (39)	13 (7)	5 (3)	1 (<1) *	3 (2)	4 (2)	7 (4)
Elmendorf	93	92 (46)	1 (<1)	0	1 (<1)	0	0	0
Fairbanks	10	8 (4)	3 (1)	1 (<1)	2 (1) *	0	0	0
Homer	2	2(1)	0	0	0	0	0	0
Kenai	2	2 (1)	0	0	0	0	0	0
Soldotna	1	1 (<1)	0	0	0	0	0	0
Valdez	1	1 (<1)	0	0	0	0	0	0
Totals	200	183 (91)	17 (9)	6 (3)	4 (2)	3 (2)	4 (2)	7 (4)

Note: Sample concentrations were less than 1 ug/L.

Less than values for MTBE analytical results

Interfering compounds masked relatively lower MTBE concentrations. The quantitation limits are higher than the threshold value of 5 ug/L. The concentrations of MTBE were reported as less than values in this case (see analytical summary results in Appendix A).

Conclusions and Recommendations

What range was found for MTBE?

MTBE was detected above the detection limit of 5 ug/L in groundwater at approximately 7 percent (4 out of 60) of all sites sampled in the MTBE study. Only 5 percent of the total sites (3 out of 60) exceeded the EPA Drinking water advisory lower limit of 20 ug/L. The highest MTBE concentrations reported in this study were 5,900 and 10,300 ug/L from one site in the Anchorage area. This particular site was an older site with a release date of 1992.

The lower concentrations of MTBE found at most of the sites sampled during this study are probably due in part to age. Many of these releases at LUST sites were before 1996. Approximately, 68 percent were reported between 1996 – 1990 and 32 percent were found when UST systems were upgraded between 1996 and 1998 before the December 1998 upgrade deadline. It is believed that the latter releases, reported after upgrades, occurred before1996 (per conversation with LUST project managers).

Is MTBE a groundwater contaminant of concern for Alaska?

Alaska was successful in obtaining a moratorium on the use of MTBE in automotive fuels shortly after its introduction in 1992. As such, it has been assumed that MTBE has not been present in Alaska long enough to cause environmental concerns. From the results of this study, it appears that contamination from MTBE is not widespread in Alaska and is limited to historical releases and urban areas where MTBE use was recorded in fall 1992 to Feb 1993.

Alaska was successful in obtaining a moratorium on the use of MTBE in automotive fuels shortly after its introduction in December of 1992, which helped decrease the demand for MTBE as an additive. Gas stations in Fairbanks North Star Borough and the Municipality of Anchorage were not required to remove the blended fuel from their tanks nor were they required to discontinue its use. Most likely some of the fuel with the additive was still in circulation until it was used up. The military had fuel contracts to purchase fuels with the additive MTBE in the Fort Elmendorf, Ft. Richardson, and Kulis military bases for the period between November 1 to March 1 each year starting in 1997. However, it is doubtful that deliveries of fuel had MTBE.

Oil refineries in Alaska have been using ethanol as a replacement for MTBE since 1993. As such, it still assumed that MTBE was not present in Alaska long enough to cause major environmental concerns. The potential risks posed to drinking water from historical releases sites still exist but are thought to be minimal.

As of March 2001, there were 1,124 open LUST sites in Alaska. Known groundwater impacts have been recorded at approximately 524 sites or 47 percent of the total open LUST sites in the state. Using the percentage MTBE impact rate of 12 percent for sites sampled in this study, over 60 sites may have potentially been impacted by MTBE. This estimate may be potentially higher because: 1) the study did not count “less than values” for samples using higher quantitation limits for MTBE (80 percent or 201 out of 252 samples), 2) some sites that are contaminated with soil only may impact groundwater 3) opportunistic sampling protocol of the MTBE study, and 4) lack of sample results from the southeast region.

MTBE Cleanup Level

Presently, there is no published drinking water or groundwater cleanup levels for MTBE and other fuel oxygenates. Further discussions on setting a cleanup limit should be made to address contamination at sites where MTBE was detected. It is most probable that Alaska may wait for EPA to set a risk based cleanup level as it doesn’t have the ability to set a cleanup level based on taste and odor. Toxicity data is lacking for MTBE.

Sampling and Analysis

Project Managers responsible for oversight of LUST sites can request sampling and analysis to be done for additives such as MTBE at sites that might have the potential to have this type of contamination (Table 2, Footnote No. 4 in the UST Procedures Manual). Most risk assessments require an assessment of the potential contaminants of concern as part of the

conceptual model. It is recommended that MTBE sampling and analysis be done for all open contaminated sites (LUST and non-LUST) with gasoline contamination that had a release date earlier than 1996. Also any site requesting to use alternative cleanup levels using Method 3 or 4 in the Contaminated Sites Regulations (18 AAC 75) should test for MTBE and other additives used in the state. In this way, data on MTBE and other additives can be recorded and tracked to help ascertain the potential impact to groundwater sources in Alaska from these sites. Efforts to ensure that MTBE does not cause harm to public health and safety and the environment should continue to be made by ADEC and responsible parties.

In addition, the ADEC Drinking Water Program is required to monitor for MTBE as an unregulated contaminant since January 2001. A select number of smaller sized systems will also required to be monitored by the state. HB 3536 introduced January 27, 2000 required all public water systems to be tested for MTBE. Data from this effort should be shared between the ADEC programs if possible.

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Appendix A: MTBE Groundwater Concentrations for MTBE Study Sites in Alaska

Region	Site ID	Site Count	Sample ID	Sample ID	MTBE ug/L	Release Report Year
Anchorage	0449	1	MW-1	1	0.001	1995
Anchorage	0449	1	MW-4	2	0.001	1995
Anchorage	0449	1	MW-5	3	0.001	1995
Anchorage	0436	2	MW-2	4	0.00113	1995
Anchorage	0472	3	MW-3	5	<0.001	1996
Anchorage	0473	4	MW-2	6	<0.001	1996
Anchorage	0468	5	MW-3	7	<0.001	1996
Anchorage	0260	6	B3MW	8	<0.01*	1991
Anchorage	0872	7	G-1	9	<0.001	1996
Anchorage	0823	8	MW-1	10	<0.1*	1994
Anchorage	2453	9	MW-5	11	0.008	2000
Anchorage	0415	10	MW-6	12	0.0287	1994
Anchorage	0149	11	MW-11	13	0.001	1990
Anchorage	0149	11	MW-13	14	0.005	1990
Anchorage	0149	11	NGS5-91	15	0.001	1990
Anchorage	0320	12	MW-3	16	<2,500	1992
Anchorage	0320	12	MW-5	17	**10,300**	1992
Anchorage	0320	12	MW-7	18	**5,990**	1992
Anchorage	0320	12	MW-8	19	1.25	1992
Anchorage	0320	12	MW-9	20	<20.0	1992
Anchorage	0320	12	MW-10	21	3.36	1992
Anchorage	0320	12	MW-11	22	59.1	1992
Anchorage	0320	12	MW-12	23	<1.00	1992
Anchorage	1275	13	MW-1	24	<0.100	1996
Anchorage	1275	13	MW-2	25	4.43/7.54	1996
Anchorage	1275	13	MW-3	26	22.2/39.7	1996
Anchorage	0073	14	MW-1	27	ND	1988
Anchorage	0073	14	MW-6	28	ND	1988
Anchorage	0073	14	MW-9	29	ND	1988
Anchorage	0073	14	MW-10	30	ND	1988
Anchorage	0164	15	MW-4	31	ND	1990
Anchorage	0164	15	MW-6	32	ND	1990
Anchorage	0164	15	MW-7	33	ND	1990
Anchorage	0164	15	MW-8	34	ND	1990
Anchorage	0164	15	MW-9	35	ND	1990
Anchorage	0164	15	MW-10	36	ND	1990
Anchorage	0164	15	MW-11	37	ND	1990
Anchorage	0164	15	MW-12	38	ND	1990
Anchorage	0164	15	MW-13	39	ND	1990
Anchorage	0164	15	MW-14	40	ND	1990
Anchorage	0164	15	MW-15	41	ND	1990
Anchorage	0164	15	MW-17	42	ND	1990
Anchorage	0164	15	WPHC-1	43	ND	1990
Anchorage	0164	15	WPHC-2	44	ND	1990
Anchorage	0164	15	WPHC-4	45	ND	1990
Anchorage	0180	16	MW-6	46	<1.00	1990
Anchorage	1237	17	MW-1	47	<1.00	1997
Anchorage	1237	17	MW-2	48	<1.00	1997

Region	Site ID	Site Count	Sample ID	Sample ID	MTBE ug/L	Release Report Year
Anchorage	1237	17	MW-3	49	**93.8/115**	1997
Anchorage	0101	18	MW-1	50	<1.00	1989
Anchorage	0101	18	MW-3	51	<1.00	1989
Anchorage	0101	18	MW-4R	52	<1.00	1989
Anchorage	0101	18	MW-12	53	<1.00	1989
Anchorage	0321	19	MW-1	54	<85.0/<5.00	1992
Anchorage	0321	19	MW-4	55	<50.0	1992
Anchorage	0321	19	MW-5	56	<1.00	1992
Anchorage	0321	19	MW-7	57	<1.00	1992
Anchorage	2336	20	MW-1	58	<1.00	1998
Anchorage	2336	20	MW-2	59	30.3/20.0	1998
Anchorage	2336	20	MW-3	60	35.3/20.0	1998
Anchorage	2336	20	MW-4	61	<1.00	1998
Anchorage	0221	21	MW-7	62	<1.00	1991
Anchorage	0221	21	MW-9	63	<1.00	1991
Anchorage	0221	21	MW-10	64	<1.00	1991
Anchorage	0221	21	MW-11	65	<50.0	1991
Anchorage	0221	21	MW-15	66	<1.00	1991
Anchorage	0094	22	MW-13	67	<1.00	1989
Anchorage	0094	22	OS-1	68	<1.00	1989
Anchorage	0094	22	OS-2	69	<1.00	1989
Anchorage	0094	22	OS-3	70	<1.00	1989
Anchorage	0193	23	MW-1	71	<250	1990
Anchorage	0193	23	MW-3	72	<5.00	1990
Anchorage	0193	23	MW-4	73	<5.00	1990
Anchorage	0193	23	MW-7	74	<5.00	1990
Anchorage	0193	23	MW-9	75	<5.00	1990
Anchorage	0193	23	MW-11	76	<5.00	1990
Anchorage	0193	23	MW-15	77	<5.00	1990
Anchorage	1319	24	MW-1	78	<4.86	1996
Anchorage	1319	24	MW-3	79	<172	1996
Anchorage	1319	24	MW-5	80	4.74	1996
Anchorage	1319	24	MW-6	81	<1.00	1996
Anchorage	2643	25	MW-4	82	<500	2001
Anchorage	2643	25	MW-5	83	<1.00	2001
Anchorage	2643	25	MW-6	84	<1.00	2001
Anchorage	2643	25	MW-7	85	<100	2001
Anchorage	2643	25	MW-8	86	<1.00	2001
Anchorage	0056	26	MW-1	87	<1.00	1988
Anchorage	0056	26	MW-2	88	<1.00	1988
Anchorage	0056	26	MW-3	89	<1.00	1988
Anchorage	0056	26	MW-4	90	<1.00	1988
Elmendorf	LF05	27	E00-OU1-LF05-GW-1A-01	91	< 0.08	< 1995 or 1991
Elmendorf	LF05	27	E00-OU1-LF05-GW-2A-01	92	< 0.08	< 1995 or 1991
Elmendorf	LF05	27	E00-OU1-LF05-W-5-01	96	< 0.08	< 1995 or 1991
Elmendorf	LF07	28	E00-OU1-LF05-MW-03-01	93	< 0.08	< 1995 or 1991

Region	Site ID	Site Count	Sample ID	Sample ID	MTBE ug/L	Release Report Year
Elmendorf	OT56	29	E00-OU1-LF05-MW-04-01	94	< 0.08	< 1995 or 1991
Elmendorf	LF07	28	E00-OU1-LF05-NS2-02-01	95	< 0.08	< 1995 or 1991
Elmendorf	LF59	30	E00-OU1-LF59-MW-01-01	97	< 0.08	< 1995 or 1991
Elmendorf	LF59	30	E00-OU1-LF59-MW-03-01	98	< 0.08	< 1995 or 1991
Elmendorf	LF59	30	E00-OU1-LF59-MW-05-01	99	< 0.08	< 1995 or 1991
Elmendorf	LF59	30	E00-OU1-LF59-MW-06-01	100	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-46-WL-01-01	101	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-07-01	102	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-10R-01	103	< 0.74	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-16-01	104	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-24-01	105	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-25-01	106	< 3.7	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-26-01	107	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-28-01	108	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-30-01	109	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-34-01	110	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-ES4B-01	111	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-MW-37A-01	112	< 0.08	< 1995 or 1991
Elmendorf	ST41	31	E00-OU2-ST41-T40001-01	113	< 0.08	< 1995 or 1991
Elmendorf	SD25	32	E00-OU4-43-WL-09-01	114	< 0.07	< 1995 or 1991
Elmendorf	SD25	32	E00-OU4-52-WL-03-01	117	< 0.07	< 1995 or 1991
Elmendorf	SD25	32	E00-OU4-OU3MW-11-01	119	< 0.07	< 1995 or 1991
Elmendorf	SD25	32	E00-OU4-OU4W-08-01	123	< 7.3	< 1995 or 1991
Elmendorf	ST37	33	E00-OU4-48-WL-01-01	115	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-48-WL-03-01	127	< 0.37	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-76-WL-01-01	128	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-GW-4A-01	129	< 0.07	< 1995 or 1991

Region	Site ID	Site Count	Sample ID	Sample ID	MTBE ug/L	Release Report Year
Elmendorf	ST37	33	E00-OU5-NS3-02-01	130	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU3MW-06-01	131	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-01-01	132	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-02-01	133	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-06-01	134	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-07-01	135	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-08-01	136	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-09-01	137	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-10-01	138	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-11-01	139	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-13-01	140	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-14-01	141	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-16-01	142	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-31-01	143	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-OU5MW-33-01	144	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-SP1-02-01	145	< 0.07	< 1995 or 1991
Elmendorf	ST37	33	E00-OU5-SP2/6-05-01	146	< 0.07	< 1995 or 1991
Elmendorf	ST71	34	E00-OU4-49-WL-01-01	116	< 0.07	< 1995 or 1991
Elmendorf	FT23	35	E00-OU4-FP-56-01	118	< 0.37	< 1995 or 1991
Elmendorf	FT23	35	E00-OU4-OU4W-03-01	120	< 0.15	< 1995 or 1991
Elmendorf	FT23	35	E00-OU4-OU4W-04-01	121	< 3.7	< 1995 or 1991
Elmendorf	FT23	35	E00-OU4-OU4W-06-01	122	< 0.07	< 1995 or 1991
Elmendorf	FT23	35	E00-OU4-OU4W-09R-01	124	< 0.07	< 1995 or 1991
Elmendorf	FT23	35	E00-OU4-OU4W-11-01	125	< 7.3	< 1995 or 1991
Elmendorf	FT23	35	E00-OU4-OU4W-12-01	126	< 0.07	< 1995 or 1991
Elmendorf	LF02	36	E00-OU6-53-WL-01-01	147	< 0.07	< 1995 or 1991
Elmendorf	LF02	36	E00-OU6-53-WL-05-01	148	< 0.07	< 1995 or 1991

Region	Site ID	Site Count	Sample ID	Sample ID	MTBE ug/L	Release Report Year
Elmendorf	LF02	36	E00-OU6-K301-01	149	< 0.07	< 1995 or 1991
Elmendorf	LF02	36	E00-OU6-K302-01	150	< 0.07	< 1995 or 1991
Elmendorf	LF02	36	E00-OU6-OU6MW-01-01	151	< 0.07	< 1995 or 1991
Elmendorf	LF02	36	E00-OU6-OU6MW-13-01	153	< 0.07	< 1995 or 1991
Elmendorf	LF02	36	E00-OU6-OU6MW-49-01	157	< 0.07	< 1995 or 1991
Elmendorf	LF02	36	E00-OU6-OU6MW-63-01	158	< 0.07	< 1995 or 1991
Elmendorf	LF02	36	E00-OU6-OU6MW-67-01	159	< 0.07	< 1995 or 1991
Elmendorf	LF02	36	E00-OU6-OU6MW-81-01	162	< 0.07	< 1995 or 1991
Elmendorf	WP14	37	E00-OU6-OU6MW-06-01	152	< 0.07	< 1995 or 1991
Elmendorf	WP14	37	E00-OU6-OU6MW-46-01	156	< 0.07	< 1995 or 1991
Elmendorf	WP14	37	E00-OU6-OU6MW-77-01	161	< 0.07	< 1995 or 1991
Elmendorf	WP14	37	E00-OU6-OU6MW-82-01	163	< 0.07	< 1995 or 1991
Elmendorf	SD15	38	E00-OU6-OU6MW-17-01	154	< 0.07	< 1995 or 1991
Elmendorf	SD15	38	E00-OU6-OU6MW-18-01	155	< 0.07	< 1995 or 1991
Elmendorf	SD15	38	E00-OU6-OU6MW-70-01	160	< 0.07	< 1995 or 1991
Elmendorf	SD15	38	E00-OU6-OU6MW-90-01	164	< 0.07	< 1995 or 1991
Elmendorf	N. Jet Pipelines	39	E00-OU6-POL-MW-01-01	165	< 0.07	< 1995 or 1991
Elmendorf	N. Jet Pipelines	39	E00-OU6-POL-MW-02-01	166	< 0.07	< 1995 or 1991
Elmendorf	Taxiway N	40	E00-TWN-OU3MW-25-01	167	< 0.07	< 1995 or 1991
Elmendorf	Taxiway N	40	E00-TWN-TWN-MW-46-01	168	< 0.07	< 1995 or 1991
Elmendorf	SS43	41	E00-S1-43-WL-07-01	169	< 0.39	< 1995 or 1991
Elmendorf	SS43	41	E00-S1-43-WL-11-01	170	< 2000	< 1995 or 1991
Elmendorf	SS43	41	E00-S1-SP/-10-01-01	178	< 0.2	< 1995 or 1991
Elmendorf	SS43	41	E00-S1-SP/-10-04-01	179	< 0.39	< 1995 or 1991
Elmendorf	SS43	41	E00-S1-W-4-01	180	< 0.2	< 1995 or 1991
Elmendorf	SERA Misc.	42	E00-S-403-WL-01-01	181	0.9	< 1995 or 1991
Elmendorf	SERA Misc.	42	E00-S-703-WL-02-01	182	7	< 1995 or 1991

Region	Site ID	Site Count	Sample ID	Sample ID	MTBE ug/L	Release Report Year
Elmendorf	SERA Misc.	42	E00-S-785-WL-05-01	183	< 0.2	< 1995 or 1991
Elmendorf	ST61	43	E00-S1-45-WL-02-01	171	< 0.08	< 1995 or 1991
Elmendorf	ST36	44	E00-S1-56-WL-01-01	172	< 0.2	< 1995 or 1991
Elmendorf	ST36	44	E00-S1-56-WL-03-01	173	< 0.2	< 1995 or 1991
Elmendorf	ST36	44	E00-S1-56-WL-04-01	174	< 0.2	< 1995 or 1991
Elmendorf	ST36	44	E00-S1-56-WL-05-01	175	< 0.2	< 1995 or 1991
Elmendorf	ST61	43	E00-S1-AP3567-01	176	< 0.08	< 1995 or 1991
Elmendorf	ST61	43	E00-S1-AP3606-01	177	< 0.08	< 1995 or 1991
Fairbanks	AAA	45	G-2	184	<0.001	??
Fairbanks	0960	46	MW-3	185	<0.001	1990
Fairbanks	0915	47	MW-8a	186	<0.001	1989
Fairbanks	1164	48	MW-3	187	<0.001	1996
Fairbanks	0976	49	MW-10	188	<0.001	1991
Fairbanks	1163	50	MW-4	189	<0.01*	1996
Fairbanks	0968	51	MW-1	190	43.7** and 0.744	1990
Fairbanks	1343	52	MW-1	191	0.00493	1997
Fairbanks	BBB	53	MW-3	192	<0.001	??
Fairbanks	0900	54	VES-6	193	8.0 ug/l	1989
Fairbanks	0900	54	MW-5	194	8.0 ug/l	1989
Homer AP	2260	55	G-2	195	<0.001	1999
Homer Spt	1495	56	MW-3	196	<0.001	1998
Kenai	1249	57	G-3	197	<0.001	1997
Kenai	0862	58	G-2	198	<0.002	1995
Soldotna	0835	59	MW-1	199	<0.002	1994
Valdez	CCC	60	MMW-2	200	<0.025	??

*Detection limit higher due to sample dilution required for analysis

** Re-analysis 8/23/00 0.744 mg/L Results & DL in question due to high dilution required for analysis